

Background

Between July 2nd and September 5th Simon Lewis and me (Wannes Hubau) did a second census on 9 primary forest plots located in Salonga National Park, DRC. This mission was supported by the ERC Advanced Grant 'Tropical Forests in the Changing Earth System' (T-FORCES) at Leeds University, UK. For those who have heard of "The Salonga", the park often has a mythical status. It is located in the deep heart of the dark forests of the Congo Basin, it is very hard to access and it contains a number of near-mythical creatures such as the African slender-snouted crocodile, the forest elephant, the bonobo (pygmy chimpanzee) and the Congo peafowl. The latter two are endemic in the Congo Basin.

Salonga National Park (1°00'-3°20'S, 20°-22°30'E) is the world's second largest tropical rainforest national park. It was already proposed as the Tshuapa National Park in 1956 by the Belgians and it gained its present boundaries with a 1970 decree by President Mobutu Sese Seko. The park was declared a UNESCO World Heritage Site in 1984 and added to the List of World Heritage in Danger in 1999. The park has been cleared of any human presence. There are no settlements and no roads. The last remaining residents of the park, the Iyaelima, are under pressure to leave the park by the *Institut Congolais pour la Conservation de la Nature* (ICCN).

Most of the park is located in the vast Equateur Province of DRC, on roughly 600 km from the capital Mbandaka. Parts of the forest are located in the Bandundu and Kasai provinces. It is composed of a Northern and a Southern block, together forming two vast green "lungs" of approximately 3.600.000 ha. The two blocks are separated by a 40-45 km-wide corridor where people that were evacuated from the park started new settlements such as the village of Monkoto, home to the headquarters of the bodies managing the park (ICCN, WWF, WCS and FARDC).

Especially the fact that it is very hard to access makes the park a "dream that will never come true" for many forest scientists. For long it has only been accessible by water using dug-out canoes (= pirogues) or over land using motorcycles or bicycles. The roads through the rainforest of Equateur are very bad and unpredictable and countless places are impossible to cross with a car. There is an airstrip in Monkoto village, and a single small plane of *Aviation Sans Frontieres* (ASF) comes by once a week. However, motorcycles and small planes do not have the capacity to carry large amounts of food or equipment. Therefore, transport of goods is exclusively done over water. However, it takes many days to weeks to drive a pirogue (=dug-out canoe) or a baleinière (=small wooden flat boat) from Mbandaka to the park.

Poaching has been a major activity in the Salonga National Park since the 90's, when the Mobutu regime collapsed and a group of ex-FAZ (*Forces Armées Zaïroises*) soldiers tried to find their fortune in the forests. Poaching was done with heavy military arms and kept on threatening the forest until very recently. Anybody who wanted to travel or work in the park had to pay commission fees to the poachers who were at that time the absolute rulers in the forest. This is also one of the reasons why the park has hardly been visited by scientists. However, renewed anti-poaching pressure heavily reduced poaching activities since 2010. The international NGO's WWF and WCS played an important role in strengthening DRC's own ICCN. But most importantly, the Congolese army (FARDC – *Forces Armées de la République Démocratique du Congo*) committed over 300 military personnel to root

out the poachers through “Operation Bonobo” since 2011. The military conducted a sweep of the park and surrounding communities to seize illegal weapons and arrest suspected poachers.

Poaching activities disturbed the forest ecology very badly. This forest can support at least 20.000 elephants, but only 2000 remain. Bonobos are threatened by hunting for meat and the live animal trade. Though logging companies are scarce in the region, the area’s current peace and relative stability may lead to an upsurge in logging activity and new roads that facilitate access to natural resources. Also, the map of Salonga National Park has very recently been cut into pieces for oil exploration by several oil companies, including UK’s Soco who caused international outrage when it was given permission to conduct seismic testing in Africa's oldest and most diverse Virunga National Park. It is only a matter of time before these horrible plans become real.

Preparation and travel

Our expedition was organised in collaboration with WCS. Their representative or “*Point Focale*” in Mbandaka helped us out to get all equipment from Kinshasa to Mbandaka and to buy all food supplies on the markets of Mbandaka. After all these (very stressful) preparations, we tied two of the WCS pirogues together, loaded them with roughly 400 kg of equipment and food and 1800 l of fuel for the road. We made a small rain- and sun shelter using tarpaulins and set off towards the village of Monkoto, located in the corridor between the Northern and the Southern Salonga NP blocks. The trip took 6 days, following first the Ruki, then the Momboyo and finally the Luilaka rivers. The Ruki river is very wide, especially near Mbandaka where it spills its waters into the even vaster Congo river. The Momboyo and Luilaka rivers are relatively narrow and they are meandering all the time, so that it gets very hard to keep up with orientation.

On the road, we came across numerous small fishing villages with huts on stilts. We also visited several old missionary posts with old brick-walled buildings, which seems to be an impressive achievement in the middle of the rainforest. On the 5th day, after what could have been the 134th turn in the Luilaka river, we had our first glimpse of the park. The Luilaka river is the northern boundary of the Southern block of the park. Once beyond a certain point, you have the park on the right and the corridor on the left. It is striking to see how many fishing villages there are on the left river bank, compared to the complete absence of villages on the right, where the park is. It might have been coincidence, but minutes after we entered the park area, we saw our first flock of monkeys.

Once we arrived in Monkoto, we first greeted all officials (DGM, WWF, WCS, FARDC, ICCN), finished all necessary “*formalités*” and composed the field team. We were accompanied by John Tshibamba Mukendi, a Congolese PhD student who’s working on reconstructions of Holocene forest dynamics using the hardly explored soil charcoal archive. John was supported by the Belgian Africamuseum to join our expedition and gather samples from a region that is now hardly known to the scientific community. As such, we could form two teams: a first team led by John for digging pits and collecting charcoal and a second team led by us for plot inventories. The team of John also organised collections of leave samples, not only for herbarium specimens but also for phylogenetic analysis (research of Olivier Hardy from the Belgian ULB university). In this way, we combined fieldwork for at least three different research projects. After we engaged 9 people from Monkoto village and

surroundings, we again set off with the pirogues, down the Luilaka river towards an entrance to the park.

The plots

The plots were installed in 2008 by the World Wide Fund for Nature (WWF) and Wildlife Conservation Society (WCS) within the CARPE Salonga National Park consortium, in collaboration with the Center for Tropical Forest Science (CTFS) of the Smithsonian Tropical Research Institute. The consortium installed 4 plots in very young pioneer forest near Monkoto village in the corridor between the two blocks of Salonga NP, 4 plots in older secondary forest just next to the abandoned Lokofa settlement and 9 plots in old-growth primary rainforest on a 2h walk from the Lokofa site in the Southern block of the Salonga NP. The idea was to show that intact primary rainforest stocks more carbon than disturbed forest types. The 8 pioneer and secondary forest plots are relatively easy to access and they have been recensused by the same consortium in 2011. Therefore, we focused on recensus of the 9 primary forest plots.

From Monkoto village, we travelled about 1h downstream until we arrived at what can be best described as a hole in the seemingly impenetrable green wall of lush tropical vegetation along the Luilaka river. Once through the hole, we could follow a small path leading to a group of houses that is known as Lokofa. This was one of the settlements that were evacuated after the installation of the park in 1970. Except for the abundance of secondary forest species in the area, nothing reminds of the former presence of a village. Until 2011, the Lokofa field site was still an important poacher camp but after the poachers had been wiped out by the FARDC troops, WCS constructed 3 new buildings as a shelter for the ICCN ecoguards. The Lokofa site has been chosen by WCS and ICCN to install a group of ecoguards who have to protect the bonobo and elephant populations in the area. Once these animals will be freed from the horrors of the intense poaching activities that dominated the Salonga forests for decades, ICCN will install some infrastructure for ecotourism, including a viewing platform at the nearby Tikalikali elephant bai, which is one of the largest in the Salonga region.

In Lokofa, we organised a group of about 20 people, including our own team, to help carrying all our equipment to the camp site, which was located on a 2h walk from Lokofa. The trail first led through the secondary forests containing 4 of the plots WCS recensused in 2011. Next, it led through the rather impenetrable Nguma swamp before reaching the incredibly clear Nguma stream from which the banks steeply rise towards a large flat plateau covered by terra firme primary rainforest. This is the area where the 9 primary rainforest plots were installed in 2008 and where we would build our camp for the next 40 days.

The plots were located on 50 m from the camp. The 9 plots are installed in a 3 x 3 square with 600 m in between each plot. The tags and the paint (POM) were mostly still present. The inventory protocol in 2008 was largely the same as the RAINFOR protocol, with the exception of the subplot system. These 9 plots were only divided into four 50x50m subplots, which hampers stringing and tree localisation. However, the plots were all perfectly outlined (exactly 100x100m), the trees were measured in a good way (few negative growth after recensus) and only very few trees were missed

in 2008. All lianas with DBH>5cm (DL) were measured in 2008. We kept the same DBH threshold during recensus, and we added DH and Dmax measurements. The plots exhibit no signs of recent human disturbance, except for some tags that have been taken away or replaced by poachers. Also, the poacher known as “microbe” carved his name in several trees. This cold-blooded 21th century equivalent of Conrad’s ivory trader Kurtz is very well-known and feared by many people in the Salonga region.

Although the plots exhibit nearly no signs of recent human presence, our discovery of large amounts of charcoal and pottery shards in 2 out of 6 pits indicates that this site has been occupied by humans. Some of the plots might have been part of the village grounds, while others might have been part of the slash-and-burn system. The current species composition is typical for mature rainforest, but tree heights and diameters indicate that the forest is probably not very old. Radiocarbon dating of charcoal fragments will indicate how old the forest actually is now. The plots were very variable with stem counts ranging between 297 and 441 and a large natural storm gap in 1 plot.

All plots contain old or recent nests of bonobos, who visit the plots regularly, sometimes even while we were there. Furthermore, we observed a total number of 6 monkey species, sometimes in packs of 50-70 individuals. Especially black-crested mangabey is very abundant. Also, the plots are all sliced up by elephant tracks and many trees are damaged by elephants. Especially the bark of *Erythrophloeum suaveolens* seems to be consumed by elephants. In one of the plots, we found the remains of a dead elephant (bones and teeth) that was killed by the poacher Microbe years ago, as his name was unmistakably carved in a tree just nearby. We could clearly identify the actual spot where the elephant was killed and the place where the poachers roasted the meat (for which they cut a few trees from the plot). The Horror, the Horror...

Getting back

Recensus and sample collection took 40 days, divided in three time blocks with two short rest periods back in Monkoto village. During one of the rest periods, we organised a one-day expedition with a WCS pirogue to search for other terra firme sites further upstream the Luilaka river. As the 9 Nguma plots are probably not very old, it will be very useful to install some plots in an older primary rainforest. Once this will be done, we will have four plot sites ranging the whole spectrum of young secondary, old secondary, young primary and old primary forest. During our prospection, we identified a large terra firme plateau covered with mature rainforest that might be older than the Nguma forest (at first sight there were more larger trees). This site is known as Bionga-Bionga and it is located very near Monkoto, which will facilitate fieldwork organisation.

After we finished the Nguma plots, we wanted to install a first plot in Bionga-Bionga. Unfortunately, we were unable to do this as we were suddenly evacuated from the Equateur Province because of a small Ebola outbreak near Watsi Kengo and Boende, on about 80 km North of Monkoto village. According to the WHO, “The Democratic Republic of Congo raised its death toll from the Ebola virus to 42 on Wednesday [1 Oct 2014] as it struggled to contain the 2nd outbreak of the disease in Africa this year [2014]. The latest figures include 8 health workers, Health Minister Felix Kabange Numbi said in a message sent to AFP.” WCS sent the pirogues from Mbandaka to pick us up in Monkoto. We



Figure 5 river views



Figure 6 baleinière on its way from Mbandaka to Monkoto



Figure 7 the expedition organisers: Wannas Hubau, John Tshibamba Mukendi, Simon Lewis



Figure 10 Simon catching some sleep



Figure 9 the complete field team at WCS headquarters in Monkoto



Figure 8 Monkoto airstrip



Figure 12 ICCN ecoguard at Lokofa



Figure 11 on our way to the Nguma camp site



Figure 13 struggling through Nguma swamp

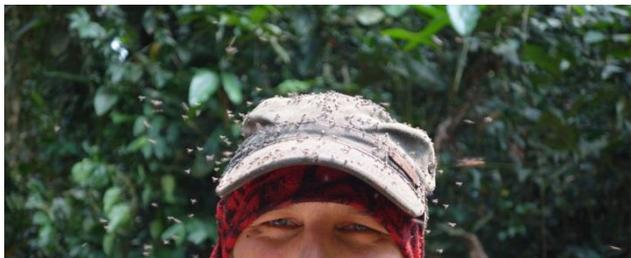




Figure 17 collecting soil charcoal



Figure 16 collecting soil samples



Figure 18 measuring lianas



Figure 19 preparing herbarium specimens



Figure 20 measuring a ladder tree





Figure 25 food: fufu



Figure 26 food: fresh fish



Figure 24 bonobo food: *Annonidium mannii* fruit, also delicious for us



Figure 27 food: caterpillars or mbindju



Figure 29 food: salted fish or makaibu



Figure 28 black-crested mangabey



Figure 30 pottery shards in one of the pits



Figure 31 elephant remains on one of the plots